ESD-Demoboard

General Description:

The ESD demo board is a hands-on setup that allows participants in seminars and training courses on ESD to experience firsthand the damage and destruction of an ESD-sensitive component (ESDS).

This results in a lasting learning effect: Anyone who has experienced this experiment will understand the invisible dangers of ESD very well and never forget them!

The battery-powered circuit of the ESD demo board forms an astable multivibrator, which is periodically controlled via a field-effect transistor (FET).

The control terminal (gate) of the FET can be touched by an electrostatically charged person via a connected contact surface. This allows the effects of electrostatic discharge (ESD) on the field-effect transistor (FET) to be observed.

Detecting ESD damage

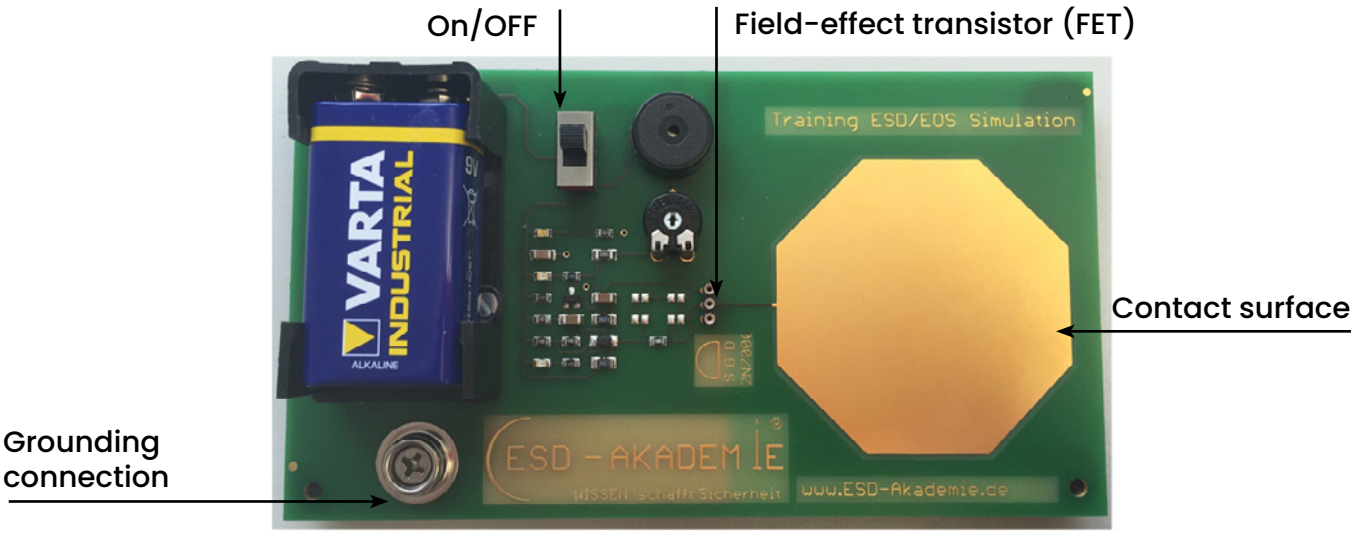
Under normal, fault-free conditions, two LEDs flash alternately, accompanied by an audible signal (beep) at a steady frequency.

If the FET is subjected to a significant ESD charge, the flashing and beeping frequencies of the circuit change: This indicates that the FET has been previously damaged by ESD.

If the FET is subjected to an ESD load exceeding a critical threshold, it is destroyed and the circuit ceases to function, which is indicated by a continuous signal.

The FET is socketed and can therefore be easily replaced.

To prevent the other components of the circuit from also being destroyed by ESD, the FET is decoupled from them via a high-resistance path.



Replacement FET transistors (20 pcs. included), Item No. EP1501003
To ensure proper operation, please use only these transistors!

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Experimental Setup and Procedure

Place the ESD demo board on a table and connect it to ground using a standard 10 mm ESD cable (coiled cable).

The experimenter, who should be grounded to the same potential using an ESD wrist strap if possible, removes a new FET from its packaging and inserts it into the designated socket.

After powering on the ESD demo board, a green standby LED lights up and two LEDs flash alternately at a steady frequency. An audible signal (beep) sounds at the same frequency.

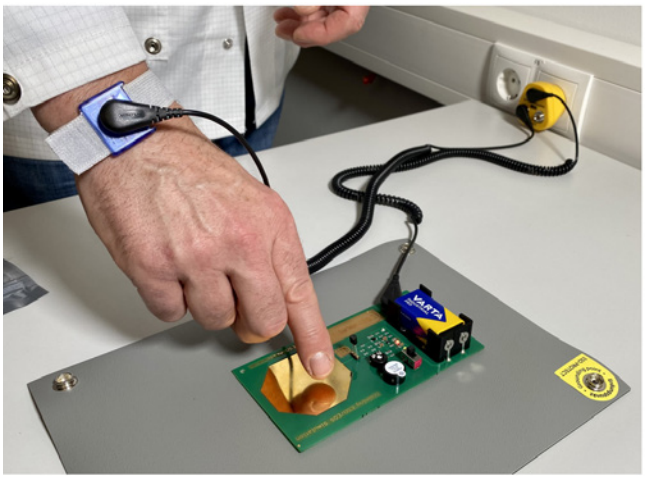
First, the grounded, non-electrostatically charged experimenter touches the contact surface of the ESD demo board with a finger or thumb.

Note: During contact, the clock frequency of the circuit may change. This is completely normal and is due to the influence of the human body's capacitance on the circuit.

The ESD demo board continues to function normally afterward.

Now the experimenter asks a participant to become electrostatically charged by walking, for example, in regular shoes across a carpeted floor and then to touch the contact surface of the ESD demo board.

Dadurch wird die elektrostatische Aufladung der Person über den FET gegenüber der Massefläche auf der Unterseite des ESD-Boards bzw. gegen die angeschlossene Systemerde entladen.



An ESD discharge occurs on the FET, which, depending on the voltage and energy of the discharge, can cause preliminary damage or destroy the FET.

If preliminary damage occurs, the circuit's flashing and beeping frequencies change. If the FET is destroyed, the circuit no longer functions, which is indicated by a continuous signal.

The contact surface can be touched multiple times, for example, to continuously stress an initially damaged FET until it is destroyed.

To further enhance the learning effect, it is optimal to measure the person's charge using an electric field meter and a voltage probe / charge plate (walking test).

The FET is pre-damaged even by relatively low electrostatic voltages (ESD).

With repeated stress or electrostatic charging, the discharge via the contact surface usually leads to the immediate destruction of the FET (EOS).

The following rules should be observed to ensure the experiment succeeds optimally:

The described experiment will not succeed within a standard-compliant ESD protection area (EPA), as no electrostatic charging or discharging of critical magnitude occurs there.

When replacing the FET transistors, no significant ESD stress must occur so as not to destroy the new FET already during installation into the ESD demo board. Ideally, the experimenter should be grounded via a grounding wrist strap to the same potential as the demo board.

To protect the rest of the circuit, the ESD demo board should only be touched at the edges and should always be stored and transported in its original packaging.

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Contents of the package

- 1 ESD demo board, fully assembled and tested.
- 1 battery (9-volt E-block, 6LR61).
- 1 set of instructions
- 20 FET replacement transistors, item no. EP21501003*

*If needed, the replacement transistors (FETs) can be purchased through our shop.

Optional accessories

- EP0101001: Grounding module 3xDK10, 1 MΩ,
- EP0103006: Grounding cable 1.50 m, DK10-DK10,
- EP0103007: Grounding cable 0.25 m, DK10-DK10,
- EP0105001: DK10 wrist strap,
- EP0103011: 2.00 m coiled cable, DK10-DK10,
- EP1501003: 20 FET replacement transistors (please use only these for proper operation)
- Work mat 210 x 297 mm (DIN A4), with 4 connectors